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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/258,961

03/01/99

JIANG

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98-0645.1

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MM91/1018

EXAMINER

FAREKH, N

ART UNIT

PAPER NUMBER

2811

DATE MAILED:

10/18/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/258,961

Applicant(s)
Jiang et al

Examiner
Nitin Parekh

Art Unit
2811



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Jul 27, 2001

2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 24-36 is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 24-36 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 6 and 1

20) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 24-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586) and/or Akram et al (US Pat. 5739585).

Regarding claims 24-26, the admitted prior art (Fig.1A and B; pages 2-4) et al discloses a semiconductor package comprising :

- a substrate comprising a first surface, a second surface, a plurality of conductors and ball bonding pads formed on the first surface and a bonding opening from the first surface to the second surface
- a semiconductor die having a first outline and a face on the bonding opening bonded to the second surface
- first mask on the first surface of the substrate comprising a plurality of via openings aligned with the ball bonding pads

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- a second mask substantially covering a second surface of the substrate
- an adhesive layer between the die and the substrate in the die attach area to bond the face to the second mask and the substrate,
- a plurality of wires placed through the bonding opening and wire bonded to the die and to the conductors
- an encapsulating material/resin on the die and the second mask, and
- a glob top in the bonding opening encapsulating the wires.

The admitted prior art (APA) fails to specify directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to but only slightly larger than the first outline.

Lee et al teach using a second mask having an opening through the mask with a second outline (see hatched mask area 218' with a second outline- Fig. 7; Col. 7, line 55) substantially matching that of the first outline with an open die attach area (see first outline area 204- Fig. 7) on the second surface so that the die is directly bonded to the second surface so that the solder mask can provide a better resistance against cracking at the substrate surface (Fig. 7 and Fig. 1-6; Col. 1-8). Lee et al further teach using solder mask patterns where the second outline is larger than the die attach region (Fig. 1A and B). It is a matter of design choice to select the outline/pattern of the solder mask area to achieve the desired bonding with the encapsulant and adhesion. Furthermore, Lee et al disclose die attach area, conventionally, not being covered with solder mask so that the die attaches directly to the substrate surface (Col. 8, line 7).

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Akram et al teach using conventional die attach technique where the die (18 in Fig. 10; Col. 9, line 24) is face-bonded to the second surface using typical adhesive/fill materials (Col. 4, line 26) such as an epoxy, silicone, polyimide, other dielectric material, etc.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to use a second mask having an opening and a second outline corresponding to but only slightly larger than the first outline so that the die is bonded directly to the second surface to prevent the cracking of the solder mask and to achieve the desired bonding with the encapsulant using Lee et al and Akram et al's teachings in the admitted prior art.

3. Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586) and/or Akram et al (US Pat. 5739585).

The combined teachings of Lee et al and Akram et al apply to claims 27-29 as explained above for claims 24-26.

4. Claims 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586) and/or Akram et al (US Pat. 5739585).

The combined teachings of Lee et al and Akram et al apply to claims 30-33 as explained above for claims 24-26.

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5. Claims 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586) and/or Akram et al (US Pat. 5739585).

The combined teachings of Lee et al and Akram et al apply to claims 34-36 as explained above for claims 24-26.

Response to Arguments

6. Applicant's arguments filed on 07-27-01 have been fully considered but they are not persuasive.

A. Applicant contends that Lee et al's solder mask as shown in Fig. 3-5, only covers the edges of the substrate. However, as explained above for claims 24-26, Lee et al teach using a second mask having an opening through the mask with a second outline substantially matching that of the first outline with an open die attach area (see first outline area 204- Fig. 7). This configuration provides a better resistance against cracking at the substrate surface and improved adhesion with an encapsulating resin (Col. 7, line 62; Col. 8, line 5). Lee et al further teach using solder mask patterns where the second outline can be larger than the die attach region (Fig. 1A and B). It is a matter of design choice in the chip packaging and encapsulation technology art to select the parameters such as an outline/pattern of the solder mask area, thickness, adhesion properties, etc. to achieve the desired bonding with the encapsulant and adhesion. Therefore, it

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would have been obvious to a person of ordinary skill in the art to select the area/coverage of a second mask having a second outline corresponding to but only slightly larger than the first outline using Lee et al's mask pattern in the APA.

B. Applicant contends that Lee et al's solder mask is configured to protect the circuit traces. However, Lee et al further teach that the solder mask provides better resistance to cracking than typical adhesives (Col. 7, line 60) on any surface on the substrate and liquid photoimageable solder mask such as PSR 4000 from Taiyo Corporation (the same material as described in the specification pp.10) provides good adhesion with the encapsulating materials (Col. 8, line 5). Furthermore, Lee et al disclose that conventionally the die attach area is not covered by the solder mask. Therefore, Lee et al's teaching is applied to the APA to improve the cracking resistance and adhesion.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Papers related to this application may be submitted directly to Art Unit 2811 by facsimile transmission. Papers should be faxed to Art Unit via Technology Center 2800 fax center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989).

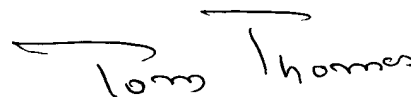
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is (703) 305-3410. The examiner can be normally reached on Monday-Friday from 08:30 am-5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached on (703) 308-2772. The fax number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724.

Nitin Parekh

10-12-01

A handwritten signature in black ink that reads "Tom Thomas". The signature is written in a cursive style with a horizontal line above the first "T" and another above the second "T".

**TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800**